Chapter 7: Work, Energy and Simple Machines

PLAY & LEARN

A puzzle workbook — crosswords, word searches, scrambles and quiz games

Print it. Solve it. Race a friend.
(No peeking at the answers!)

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ACROSS

2. the SI unit of work and energy (5)
3. a wheel-and-rope simple machine that changes force direction (6)
7. ____ energy — kinetic plus potential (10)
8. ____ energy — energy of motion (7)
10. ____ energy — heat energy (7)
12. force times displacement in the direction of force (4)

DOWN

1. the rate of doing work (5)
3. gravitational ____ energy — energy of position (9)
4. the fixed pivot point of a lever (7)
5. the force you apply to operate a simple machine (6)
6. a mode of heat transfer needing no medium (9)
9. the capacity to do work (6)
11. a simple machine that rotates about a fulcrum (5)
12. the SI unit of power (4)

Bonus word that did not fit the grid — define it in a sentence: LOAD

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Mechanics Word Search Race

L T I L G E C L T H E R M A L
Y T Y E I B Y A C V Z G H R K
K A L V L Y J I A F V M F I C
P W H E G W B T K X F U U W J
I L Z R N V V N R P U Z L A S
T W E P E I U E D Q B A C W D
K N P L O K G T P C W R R X I
E I U T R B J O U Y I A U Q F
A O N O K Q H P L G D T M S U
J K W E O D H W L L E B C O D
Q E Z H T Q Y R E W O P G U A
I Y Q W E I V J Y Q I N C N O
O E R A L A C S Y S G I K D L
H Z Y Z G A T F D V X P N W E
F N K G C N R M O E F F O R T

- [ ] POTENTIAL
- [ ] FULCRUM
- [ ] ENERGY
- [ ] PULLEY
- [ ] POWER
- [ ] LEVER
- [ ] WORK
- [ ] WATT
- [ ] KINETIC
- [ ] THERMAL
- [ ] EFFORT
- [ ] TARAZU
- [ ] JOULE
- [ ] SOUND
- [ ] LOAD
- [ ] HEAT

Race Rules

Solo: find all words. Note your time.

Pairs: one partner finds across-and-down words, the other finds diagonals. First pair to complete the list wins.

Hard mode: cover the word list. Find as many chapter terms as you can in 5 minutes.

Champion move: for every word you find, say what it means out loud. No meaning, no point.

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MECHANICS WORD SCRAMBLE

1. **A I M A L N C C H E** (kinetic plus potential energy combined) _____
2. **T A V A I L O N R I A G T** (___ potential energy – depends on height) _____
3. **F C Y I N F E E I C** (how much useful output a machine gives for its input) _____
4. **R M C L U U F** (the fixed pivot of a lever) _____
5. **R A I O D A I T N** (heat transfer that needs no medium at all) _____
6. **U O T I D N C C O N** (heat transfer through direct contact) _____
7. **I E O C V N C O N T** (heat transfer through a moving fluid) _____
8. **L D C I E N I N** (____ plane — a ramp that is a simple machine) _____

MAKE IT A GAME

- **Beat the Bell:** the teacher sets a 60-second timer. Every unscrambled word inside the bell = 1 point; a word you can also define = 3 points.
- **Chain Scramble:** in a circle, each student scrambles a chapter word for the person on their left. Miss it and you are out. Last student standing wins.

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Kinetic energy · Potential energy · Thermal energy · Fulcrum

Because: _____

Lever · Pulley · Inclined plane · Thermometer

Because: _____

Joule · Watt · Newton · Metre (energy-related units)

Because: _____

Effort · Load · Fulcrum · Radiation

Because: _____

Conduction · Convection · Radiation · Reflection

Because: _____

Work · Energy · Power · Colour

Because: _____

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A1 B3 C3 D2 E1 G2 H4 I1 L1 M3 N1 O1 P3 R1 S1 T1 U1 V4 X8 Y4 Z10

Scoring

- ☑ Each letter tile used = Its tile value
- ☑ Word is a term from this chapter = × 2
- ☑ Word is 8 letters or longer = + 10 bonus
- ☑ You can state its meaning correctly = + 5
- ☑ You can connect it to a real-life example = + 3
- ✕ Word is not in this chapter (challenged and lost) = – 5

How a Round Works

1. Player builds a word from the rack and lays it down.

2. Any opponent may challenge within 10 seconds: “That’s not in this chapter.”

3. Open the textbook. If challenger is right, builder loses 5 points. If wrong, challenger loses 5 points.

4. Builder states the meaning to claim the +5 bonus. Group votes. Play 6 rounds.

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Scoring: Guessed after clue ① = 5 pts · after ② = 3 pts · after ③ = 1 pt.

1. I am force times displacement in the direction of the force.
2. Pushing a wall with no movement means I am zero.
3. I am **work.**

1. I am the capacity to do work.
2. I can be kinetic or potential.
3. I am **energy.**

1. I am the energy a moving object has.
2. A speeding car has plenty of me.
3. I am **kinetic energy.**

1. I am the energy stored due to position.
2. Water behind a dam has plenty of me.
3. I am **(gravitational) potential energy.**

1. I am the rate of doing work.
2. My SI unit is the **watt.**
3. I am **power.**

6. I am the fixed pivot of a lever.
2. A see-saw balances around me.
3. I am the **fulcrum.**

7. I am the force you apply to a machine.
2. I am usually smaller than the load.
3. I am **effort.**

1. I am the resistance a machine works against.
2. A heavy box you are lifting is an example of me.
3. I am **load.**

9. I change the direction of a force using a wheel and rope.
2. A flag is hoisted using me.
3. I am a **pulley.**

10. I am heat transfer with no medium needed at all.
2. Sunlight reaches Earth through me.
3. I am **radiation.**

11. I am heat transfer through direct touching.
2. A metal spoon in hot tea heats up by me.
3. I am **conduction.**

12. I am heat transfer through the movement of a fluid.
2. Boiling water circulates by me.
3. I am **convection.**

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True or False Sprint

Everyone stands. Teacher reads a statement. **True** → stay standing. **False** → sit down. Get it wrong and you are out. Last student standing wins.

1. Work is done only when a force causes displacement. ☐ True ☐ False
2. Pushing hard against an immovable wall means you do a large amount of work. ☐ False
3. Kinetic energy is the energy of motion. ☐ True ☐ False
4. Potential energy depends only on speed, not position. ☐ True ☐ False
5. Power is the rate of doing work. ☐ True ☐ False
6. The SI unit of power is the joule. ☐ True ☐ False
7. A lever always has a fulcrum. ☐ True ☐ False
8. In a lever, effort is always larger than load. ☐ True ☐ False
9. Radiation needs a medium to transfer heat. ☐ True ☐ False
10. Conduction transfers heat through direct contact. ☐ True ☐ False
11. Convection involves the bulk movement of a fluid. ☐ True ☐ False
12. Mechanical energy is the sum of kinetic and potential energy. ☐ True ☐ False
13. A pulley can change the direction of an applied force. ☐ True ☐ False
14. The SI unit of energy is the same as the SI unit of work. ☐ True ☐ False

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Fill the empty 4x4 grid with any 16 words from the word bank — in any order, one per box.

Work	Energy	Kinetic energy	Potential energy
Power	Fulcrum	Effort	Load
Pulley	Lever	Joule	Watt
Radiation	Conduction	Convection	Mechanical energy

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Work & Displacement

(a) Work is zero if there is no displacement.
(b) Work is force times displacement.
(c) Pushing a wall that does not move counts as a lot of work.

The lie is _____.
Corrected: _____

Forms of Energy

(a) Potential energy depends on height.
(b) Kinetic energy depends on speed.
(c) Kinetic energy depends on height, not speed.

The lie is _____.
Corrected: _____

SI Units

(a) The SI unit of power is the watt.
(b) The SI unit of work is the joule.
(c) The SI unit of power is the joule.

The lie is _____.
Corrected: _____

Heat Transfer

(a) Radiation needs a medium.
(b) Conduction needs direct contact.
(c) Convection needs a fluid to move.

The lie is _____.
Corrected: _____

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Teacher's Note: Hide the gate cards around the classroom. Teams rotate every 4 minutes. First team to reach the door with the correct code escapes.

The Work Gate

Work = Force × Displacement. Count the words in that formula's name (force, displacement = 2 words). Use that number.

The Energy Gate

How many main types of mechanical energy are named (kinetic + potential)? Use that number.

The Heat Gate

How many modes of heat transfer are there (conduction, convection, radiation)? Use that number.

The Machine Gate

Count the letters in LEVER.

The Power Gate

Count the letters in WATT.

EXIT CODE:

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Challenge Complete.

Excellent work, team. Now go find the physics of work, energy, and simple machines hiding in real world.

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